## CLAIMS

[Claim(s)]
[Claim 1]A zone pressure drive valve having arranged in series and constituting the 1st valve that will be opened if hydrostatic pressure becomes more than the 1st threshold pressure, and the 2nd valve that will be closed if it becomes more than the 2nd threshold pressure higher than said 1st threshold pressure so that the 2nd valve may serve as the downstream rather than the 1st valve.
[Claim 2]The zone pressure drive valve comprising according to claim 1:
A valve seat body which provided said 1st valve in a valve body.
A valve element energized in the direction which is arranged in a channel formed in this valve seat body, and always closes a channel.

[Claim 3]The zone pressure drive valve comprising according to claim 1 or 2:
A valve seat body which provided said 2nd valve in a valve body.
A channel formed in this valve seat body.
A valve element which will close a channel if it becomes predetermined hydrostatic pressure although it is arranged at an entrance side of a channel and a channel is always opened.

[Claim 4]A fluid pressure control device constituting in order more than one connect with any 1 paragraph of said claim 1 – claim 3, arrange a zone pressure drive valve of a statement to one channel in it, to have changed working pressure of each zone pressure drive valve and to open only a zone pressure drive valve corresponding to hydrostatic pressure in a channel.
[Claim 5]A fluid pressure control device which is provided with the following and characterized by having changed working pressure of each zone pressure drive valve, and said zone pressure drive valve being able to operate an actuator corresponding to specified pressure.
A fluid pipe.
A zone pressure drive valve given in any 1 paragraph of said arranged claim 1 linked to [ two or more ] said fluid pipe – claim 3.
An actuator connected to said zone pressure drive valve.

[Claim 6]A catheter drive comprising:
A catheter.
A control tube provided in a catheter.
A zone pressure drive valve given in any 1 paragraph of said two or more claims 1 which operate by a different zone pressure connected to a control tube – claim 3.
Bellows connected to a zone pressure drive valve, and an operation member which can transform a catheter by extension of bellows.

[Claim 7]The catheter drive according to claim 6, wherein said control tube is arranged in a catheter, and a zone pressure drive valve penetrates a catheter and is arranged.

[Translation done.]

* NOTICES *



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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the fluid pressure control device and flexible tube drive which use the zone pressure drive valve which can pass only the defined hydrostatic pressure, and its valve.
[0002]
[Description of the Prior Art]Now, various fluid controlled valves are used for hydrostatic pressure control. That etc. for which such a fluid controlled valve used the electric type actuator as a driving means of a valve are put in practical use. However, since what uses an electric type actuator needs to be provided with an electric actuator for exclusive use for every valve, it is difficult to miniaturize, and sufficient cautions are further needed for a certain reason also for the worries about the fault current from an electric actuator, etc. about the condition of use of a valve. The wiring number for driving an electric actuator increases, and the problem which becomes complicated and bars endurance and utilization also produces the inner structure of an electric actuator. It cannot pass only hydrostatic pressure of the fixed zone which is the further present fluid pressure control valve.
[0003]
[Problem(s) to be Solved by the Invention]Then, an object of this invention is to solve the above-mentioned problem by providing the very simple zone pressure drive valve which can pass only the defined hydrostatic pressure using hydrostatic pressure common to the opening-and-closing drive of a valve, and opening-and-closing driving signal transfer of a valve. It aims at providing the fluid pressure control device which can control the drive of an actuator by predetermined fluid pressure by using the zone pressure drive valve. It aims at providing the flexible tube drive which can make the existing flexible tube crooked using the zone pressure drive valve.
[0004]
[Means for Solving the Problem]For this reason, this invention is a zone pressure drive valve characterized by comprising the following, To one channel, more than one connect, arrange said zone pressure drive valve, and working pressure of each zone pressure drive valve is changed, Are it a fluid pressure control device by which it is characterized to have constituted in order to open only a zone pressure drive valve corresponding to hydrostatic pressure in a channel, and A fluid pipe, Consist of said arranged zone pressure drive valve linked to [ two or more ] said fluid pipe, and an actuator connected to said zone pressure drive valve, and said zone pressure drive valve, Have changed working pressure of each zone pressure drive valve, are it a fluid pressure control device by which it is characterized that an actuator corresponding to specified pressure can be operated, and A catheter, A control tube provided in a catheter, and said two or more zone pressure drive valves which operate by a different zone pressure connected to a control tube, It is a catheter drive consisting of bellows connected to a zone pressure drive valve, and an operation member which can

transform a catheter by extension of bellows, It is a catheter drive, wherein said control tube is arranged in a catheter, and a zone pressure drive valve penetrates a catheter and is arranged, What makes these a means for business solution.
The 1st valve that will be opened if hydrostatic pressure becomes more than the 1st threshold pressure.
A valve seat body which is a zone pressure drive valve having arranged in series and constituting the 2nd valve that will be closed if it becomes more than the 2nd threshold pressure higher than said 1st threshold pressure so that the 2nd valve may serve as the downstream rather than the 1st valve, and provided said 1st valve in a valve body.
A valve seat body which it is arranged in a channel formed in this valve seat body, is always a zone pressure drive valve consisting of a valve element energized in the direction which closes a channel, and provided said 2nd valve in a valve body.
A valve element which will close a channel if it becomes predetermined hydrostatic pressure although it is arranged at an entrance side of a channel formed in this valve seat body, and a channel and a channel is always opened.

[0005]
[Embodiment of the Invention]Hereafter, each of the zone pressure drive valve in this invention, a fluid pressure control device, and a flexible tube drive is explained one by one.
[0006][Zone pressure drive valve] drawing 1 -- the lineblock diagram of a zone pressure drive valve, and the drawing 2 (**) -- (**) -- the top view of the 1st valve (highpass valve) that uses (**) into the valve. they are a sectional view and an operation figure -- the drawing 3 (**) -- (**) -- the top view of the 2nd valve (low pass valve) that uses (**) into the valve, a sectional view, an operation figure, and drawing 4 (b) (**) (**) are the figures explaining the operating state of a zone pressure drive valve. In drawing 1, the zone pressure drive valve which 1 requires for this invention, and 5 are fluid pipes connected to the zone pressure drive valve 1, and the 1st valve 2 and the 2nd valve 3 are arranged in this zone pressure drive valve 1. The 1st valve 2 is constituted as a valve (highpass valve) which can pass only predetermined hydrostatic pressure, and the 2nd valve 3 is arranged at the downstream which adjoined said 1st valve (highpass valve) 2, and is constituted as a valve (low pass valve) which will be closed if it becomes predetermined fluid pressure.
[0007]The details of the 1st valve 1 and the 2nd valve 2 are explained below. The 1st valve 2 has the valve seat body 2a in the 1st valve body, as shown in drawing 2 (b) (**) (**). the valve seat body 2a is being fixed by the sealed state in the valve body -- the central part of the valve seat body 2a -- a hole -- 2b penetrates -- this hole -- the core (valve element) 2c is attached to 2b by the fluid sealed state, enabling free movement. Rather than the valve seat body 2a, it projects up and the core 2c is arranged, as shown in a figure, and 2 d of elastic members are arranged at the upper bed of this core 2c (elastic film etc.), and it is changing into the state where the core 2c was energized by 2 d of this elastic member so that it might be pushed in in the valve seat body 2a, and it closed the channel in this state by it. the core 2c -- the hole of the valve seat body 2a -- it formed in 2b -- it does not illustrate -- it is held where movement in a lower part is forbidden by a stopper. 2 d of elastic members are carrying out band-like, as shown in drawing 2 (b), and the both ends 2e are being fixed to the valve seat body 2a from adhesion.
[0008]In the 1st valve 2, if it becomes a predetermined pressure (the 1st threshold) with the hydrostatic pressure P in the channel connected to the 1st valve 2, while the core 2c resists the energizing force of 2 d of elastic members by hydrostatic pressure, as shown in figure (**), it will move up and the channel of the 1st valve 2 will be opened. As a result, with this 1st valve 2, when it becomes predetermined hydrostatic pressure (hydrostatic pressure beyond the 1st threshold), a channel will open and a fluid will flow out of the 1st valve 2. The gestalt of the 1st valve can use various valves, such as a valve (diaphragm valves, such as a ball valve) which has the same function, without limiting to the thing of composition of having explained here.

[0009]The 2nd valve has the valve seat body 3a, and the valve seat body 3a is being fixed in the valve body. The channel 3b as shown in figure (**) is formed in the central part of the valve seat body 3a, and the valve element 3c which becomes an entrance side of this channel 3b from a deformable elastic member is attached. The valve element 3c is always opening the channel 3b, as shown in figure (**), but if it becomes more than predetermined hydrostatic pressure (the 2nd threshold) with the speed more than [ with the hydrostatic pressure which has passed the 1st valve ] fixed, as shown in figure (**), will change the valve element 3c up, and will close the channel 3b formed in the valve seat body 3a. As a result, with this 2nd valve 3, if it becomes predetermined hydrostatic pressure (hydrostatic pressure beyond the 2nd threshold), a channel will close, and it stops that a fluid flows out of the 2nd valve 3. Various valves which have the same function can be used for the 2nd valve, without limiting to the thing of composition of having explained like the 1st valve here.

[0010]The operation of the zone pressure drive valve constituted as mentioned above is explained. Drawing 4 shows signs that a fluid is poured to the actuator A formed at the tip of a zone pressure drive valve. The input side of the zone pressure drive valve 1 is connected to the fluid pipe 5, and the output side of the zone pressure drive valve 1 is connected to the actuator A. With this zone pressure drive valve, if the hydrostatic pressure in the fluid pipe 5 becomes more than P1 (the 1st threshold), the 1st valve 2 will sometimes open, and it has a function which will be closed if hydrostatic pressure becomes further more than P2 (the 2nd threshold). That is, only when the hydrostatic pressure P is P1<P<P2, it has a function which supplies a fluid to the actuator side as follows.

[0011]That is, in the drawing 4 (**), when the hydrostatic pressure P of a fluid pipe is below P1 (the 1st threshold), the 1st valve 2 is still closed. The fluid which the 1st valve 2 opened as it was shown in figure (**), when hydrostatic pressure was more than P1 and less than P2, and passed the 1st valve 2 passes the 2nd valve 3 always opened, results in the actuator A, and operates the actuator A. In order that the 2nd valve 3 may close as shortly shown in figure (**) if hydrostatic pressure becomes more than P2 (the 2nd threshold), supply of the fluid to the actuator A stops. Here, if the working pressure (the 1st threshold, the 2nd threshold) of said 1st valve 2 and the 2nd valve 3 is changed according to each zone pressure, only when the hydrostatic pressure in a fluid pipe turns into predetermined pressure, a zone pressure drive valve will open and a fluid will be supplied to an actuator. Thus, in this zone pressure drive valve, it becomes possible to set up a different zone pressure for every zone pressure drive valve by the method of setting out of the working-fluid pressure of the 1st valve 2 and the 2nd valve 3, and it becomes possible to operate the actuator linked to them.

[0012][Fluid pressure control device] It continues and the composition of the fluid pressure control device using the above-mentioned zone pressure drive valve is explained. The fluid pressure control device explained here is provided with the three zone pressure drive valves 11, 12, and 13 as shown in drawing 5, and three zone pressure drive valves differ in working-fluid pressure, respectively. Namely, as for the zone pressure drive valve 11 which operates the actuator A1, the zone pressure drive valve 12 which operates the actuator A2, and the zone pressure drive valve 13 which operates actuator A3, the working pressure of the 1st valve 2 and the 2nd valve 3 is changed as follows.

[0013]For example, with the zone pressure drive valve 11 of the left in a figure, the working pressure of the 1st valve 2 and the 2nd valve 3 is as follows.

With the zone pressure drive valve 12 of P1<P<P2 center, it is P5<P<P6 in the zone pressure drive valve 13 of P3<P<P4 right-hand side. However, P1<P2<P3<P4<P5<P6 [0014]For this reason, in a fluid pipe, when [ both ] the flowing fluid pressure P is P1<P<P2, in order that the 1st valve 2 and the 2nd valve 3 may open, the actuator A1 operates with the zone pressure drive valve 11, but. In the actuator A2 and the zone pressure drive valves 12 and 13 corresponding to actuator A3, since the hydrostatic pressure P has not resulted even in P3 and P5 which open each 1st valve, a zone pressure drive valve is not opened but maintains a non-operative state.

[0015]In a fluid pipe, when [ both ] the flowing fluid pressure P is P3<P<P4, in order that the 1st valve 2 and the 2nd valve 3 may open, the actuator A2 operates with the zone pressure drive valve 12, but. With the zone pressure drive valve 11, the 2nd valve 3 closes, in the zone pressure drive valve 13, in order that the 1st valve 2 may not open, the actuator A1 and actuator A3 do not operate, but only the actuator A2 operates. In a fluid pipe, when the flowing fluid pressure P is P5<P<P6, only actuator A3 operates for the same reason as the above.
[0016]Thus, several zone pressure drive valves from which working pressure differs can be connected to a fluid pipe, and various fluid pressure control devices which can operate only the actuator corresponding to the zone pressure needed, respectively can be provided by controlling the hydrostatic pressure in a fluid pipe.
[0017][Flexible tube drive] It continues and the flexible tube drive which uses the above-mentioned zone pressure drive valve is explained. Here, the example which uses the catheter which a medical field may be sufficient as and is used as a flexible tube is explained. Non-invasion, and the inspection of low invasion and medical science are increasing now which greeted the aged society. There is a catheter as one of low invasion medical devices. A catheter is a thin pipe inserted from the cancellation blood vessel of an upper extremity and the membrum inferius for the medical examination of a blood circulatory system disease, and is a medical device mainly used for contrast-medium pouring etc. for internal pressure measurement of the circulatory system, the collection of a blood sample, and angiography. By low invasion, since it can diagnose, it is used briskly clinical [ of the surgery ].
[0018]However, the inside of a blood vessel is dramatically narrow, and it is dramatically difficult to insert by the catheter which is used now and it not only is distorting, but uses a guide wire since there is much branching. Then, the active catheter which a catheter can curve the truncus freely itself and can choose a course at the turning point of a blood vessel is called for. Therefore, research of the active catheter is done from the former in some research institutions. However, being used by these researches has a shape memory alloy and main special polymer, and since it is an electric type actuator altogether, when the worst, there is fear of fault current. Inner structure is still more complicated and there is a problem which bars utilization, such as endurance and an increase in a wiring number.
[0019]Then, this flexible tube drive (catheter drive) uses the good physiological saline of biocompatibility for both a drive and a transmission-medium driving signal, and constitutes it as a device with high safety which consists of a simple mechanism using the above-mentioned zone pressure drive valve. Drawing 6 is an entire configuration figure of a flexible tube drive (catheter drive), and drawing 7 is an important section enlarged drawing of the catheter.
[0020]In drawing 6 and drawing 7, 21 is a flexible catheter and the control tube 22 corresponding to the fluid pipe mentioned above inside this catheter 21 is arranged, Two or more zone pressure drive valves 24, 25, and 26 are attached to this control tube 22 in the state of penetrating the catheter 21. The operation members 31, 32, and 33 are being fixed to the position which abbreviates to the periphery of the catheter 21, is and is divided into many divisions (it trichotomizes in this example) in a pitch, The end of the elastic bellows 27, 28, and 29 connected to said zone pressure drive valves 24, 25, and 26 is attached to these operation members 31, 32, and 33, respectively. For this reason, when the bellows 27, 28, and 29 are extended, while said operation members 31, 32, and 33 are pushed and the operation members 31, 32, and 33 fall by this, it has the composition of giving modification to the catheter 21. And said bellows, the operation member, and the catheter are covered with the covering tube 23. A control tube can also be arranged on the outside of a catheter if needed.
[0021]In the above-mentioned catheter drive, into the control tube 22, if predetermined fluid pressure is passed from the fluid pressure generator which is not illustrated, the zone pressure drive valve (for example, valve of the numerals 24) corresponding to the fluid pressure opens, the bellows 27 will develop, the operation member 31 will be pressed, and the operation member 31 will

be pushed down. As a result, the catheter 21 of this portion will be crooked. In this way, by controlling the fluid pressure in a control tube suitably, the zone pressure drive valve of the part to need can be opened, bellows can be expanded, and a catheter can be changed.

[0022]As mentioned above, although the embodiment of the invention has been described, the 1st valve and the 2nd valve can use the thing of other composition, if the same function can be done so. It can be aimed at various fluid pipes which do not limit to a catheter as a flexible tube, but have flexibility.The working fluid of a zone pressure drive valve can apply a fluid, a gas, etc. Furthermore, this invention can be carried out in any of other forms, without deviating from the pneuma or main features. Therefore, at all points, the above-mentioned embodiment is only mere illustration, and must not be interpreted restrictively.

[0023]

[Effect of the Invention]As explained to the above details, according to this invention, the very simple zone pressure drive valve which can open a channel only at the time of the defined hydrostatic pressure can be provided using hydrostatic pressure common to the opening-and-closing drive of a valve, and opening-and-closing driving signal transfer of a valve. Since the electrical and electric equipment etc. are not used when driving a zone pressure drive valve, there are no worries about fault current etc., it is simple and a zone pressure drive valve can be used as the small valve excellent in endurance. Several zone pressure drive valves from which working pressure differs can be connected to a fluid pipe, and only the actuator corresponding to the zone pressure needed, respectively can be operated by controlling the hydrostatic pressure in a fluid pipe. Since no electric type actuator is used but the physiological saline is used for both the drive and the transmission-medium driving signal, when this zone pressure drive valve is used for a catheter, The effect which was excellent in ** -- the catheter drive which consists of a simple mechanism in which safety is high can be provided -- can be done so.

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## TECHNICAL FIELD

[Field of the Invention]This invention relates to the fluid pressure control device and flexible tube drive which use the zone pressure drive valve which can pass only the defined hydrostatic pressure, and its valve.

[Translation done.]

## PRIOR ART

[Description of the Prior Art]Now, various fluid controlled valves are used for hydrostatic pressure control. That etc. for which such a fluid controlled valve used the electric type actuator as a driving means of a valve are put in practical use. However, since what uses an electric type actuator needs to be provided with an electric actuator for exclusive use for every valve, it is difficult to miniaturize, and sufficient cautions are further needed for a certain reason also for the worries about the fault current from an electric actuator, etc. about the condition of use of a valve. The wiring number for driving an electric actuator increases, and the problem which becomes complicated and bars endurance and utilization also produces the inner structure of an electric actuator. It cannot pass only hydrostatic pressure of the fixed zone which is the further present fluid pressure control valve.

[Translation done.]

## EFFECT OF THE INVENTION

[Effect of the Invention]As explained to the above details, according to this invention, the very simple zone pressure drive valve which can open a channel only at the time of the defined hydrostatic pressure can be provided using hydrostatic pressure common to the opening-and-closing drive of a valve, and opening-and-closing driving signal transfer of a valve. Since the electrical and electric equipment etc. are not used when driving a zone pressure drive valve, there are no worries about fault current etc., it is simple and a zone pressure drive valve can be used as the small valve excellent in endurance. Several zone pressure drive valves from which working pressure differs can be connected to a fluid pipe, and only the actuator corresponding to the zone pressure needed, respectively can be operated by controlling the hydrostatic pressure in a fluid pipe. Since no electric type actuator is used but the physiological saline is used for both the drive and the transmission-medium driving signal, when this zone pressure drive valve is used for a catheter, The effect which was excellent in ** -- the catheter drive which consists of a simple mechanism in which safety is high can be provided -- can be done so.

[Translation done.]

## TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Then, an object of this invention is to solve the above-mentioned problem by providing the very simple zone pressure drive valve which can pass only the defined hydrostatic pressure using hydrostatic pressure common to the opening-and-closing drive of a valve, and opening-and-closing driving signal transfer of a valve. It aims at providing the fluid pressure control device which can control the drive of an actuator by predetermined fluid pressure by using the zone pressure drive valve. It aims at providing the flexible tube drive which can make the existing flexible tube crooked using the zone pressure drive valve.

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## MEANS

[Means for Solving the Problem]For this reason, this invention is a zone pressure drive valve characterized by comprising the following, To one channel, more than one connect, arrange said zone pressure drive valve, and working pressure of each zone pressure drive valve is changed, Are it a fluid pressure control device by which it is characterized to have constituted in order to open only a zone pressure drive valve corresponding to hydrostatic pressure in a channel, and A fluid pipe, Consist of said arranged zone pressure drive valve linked to [ two or more ] said fluid pipe, and an actuator connected to said zone pressure drive valve, and said zone pressure drive valve, Have changed working pressure of each zone pressure drive valve, are it a fluid pressure control device by which it is characterized that an actuator corresponding to specified pressure can be operated, and A catheter, A control tube provided in a catheter, and said two or more zone pressure drive valves which operate by a different zone pressure connected to a control tube, It is a catheter drive consisting of bellows connected to a zone pressure drive valve, and an operation member which can transform a catheter by extension of bellows, It is a catheter drive, wherein said control tube is arranged in a catheter, and a zone pressure drive valve penetrates a catheter and is arranged, What makes these a means for business solution.
The 1st valve that will be opened if hydrostatic pressure becomes more than the 1st threshold pressure.
A valve seat body which is a zone pressure drive valve having arranged in series and constituting the 2nd valve that will be closed if it becomes more than the 2nd threshold pressure higher than said 1st threshold pressure so that the 2nd valve may serve as the downstream rather than the 1st valve, and provided said 1st valve in a valve body.
A valve seat body which it is arranged in a channel formed in this valve seat body, is always a zone pressure drive valve consisting of a valve element energized in the direction which closes a channel, and provided said 2nd valve in a valve body.
A valve element which will close a channel if it becomes predetermined hydrostatic pressure although it is arranged at an entrance side of a channel formed in this valve seat body, and a channel and a channel is always opened.

[0005]
[Embodiment of the Invention]Hereafter, each of the zone pressure drive valve in this invention, a fluid pressure control device, and a flexible tube drive is explained one by one.
[0006][Zone pressure drive valve] drawing 1 -- the lineblock diagram of a zone pressure drive valve, and the drawing 2 (**) -- (**) -- the top view of the 1st valve (highpass valve) that uses (**) into the valve. they are a sectional view and an operation figure -- the drawing 3 (**) -- (**) -- the top view of the 2nd valve (low pass valve) that uses (**) into the valve, a sectional view, an operation figure, and drawing 4 (b) (**) (**) are the figures explaining the operating state of a zone pressure drive valve. In drawing 1, the zone pressure drive valve which 1 requires for this invention, and 5 are

fluid pipes connected to the zone pressure drive valve 1, and the 1st valve 2 and the 2nd valve 3 are arranged in this zone pressure drive valve 1. The 1st valve 2 is constituted as a valve (highpass valve) which can pass only predetermined hydrostatic pressure, and the 2nd valve 3 is arranged at the downstream which adjoined said 1st valve (highpass valve) 2, and is constituted as a valve (low pass valve) which will be closed if it becomes predetermined fluid pressure.

[0007]The details of the 1st valve 1 and the 2nd valve 2 are explained below. The 1st valve 2 has the valve seat body 2a in the 1st valve body, as shown in drawing 2 (b) (**) (**). the valve seat body 2a is being fixed by the sealed state in the valve body -- the central part of the valve seat body 2a -- a hole -- 2b penetrates -- this hole -- the core (valve element) 2c is attached to 2b by the fluid sealed state, enabling free movement. Rather than the valve seat body 2a, it projects up and the core 2c is arranged, as shown in a figure, and 2 d of elastic members are arranged at the upper bed of this core 2c (elastic film etc.), and it is changing into the state where the core 2c was energized by 2 d of this elastic member so that it might be pushed in in the valve seat body 2a, and it closed the channel in this state by it. the core 2c -- the hole of the valve seat body 2a -- it formed in 2b -- it does not illustrate -- it is held where movement in a lower part is forbidden by a stopper. 2 d of elastic members are carrying out band-like, as shown in drawing 2 (b), and the both ends 2e are being fixed to the valve seat body 2a from adhesion.

[0008]In the 1st valve 2, if it becomes a predetermined pressure (the 1st threshold) with the hydrostatic pressure P in the channel connected to the 1st valve 2, while the core 2c resists the energizing force of 2 d of elastic members by hydrostatic pressure, as shown in figure (**), it will move up and the channel of the 1st valve 2 will be opened. As a result, with this 1st valve 2, when it becomes predetermined hydrostatic pressure (hydrostatic pressure beyond the 1st threshold), a channel will open and a fluid will flow out of the 1st valve 2. The gestalt of the 1st valve can use various valves, such as a valve (diaphragm valves, such as a ball valve) which has the same function, without limiting to the thing of composition of having explained here.

[0009]The 2nd valve has the valve seat body 3a, and the valve seat body 3a is being fixed in the valve body. The channel 3b as shown in figure (**) is formed in the central part of the valve seat body 3a, and the valve element 3c which becomes an entrance side of this channel 3b from a deformable elastic member is attached. The valve element 3c is always opening the channel 3b, as shown in figure (**), but if it becomes more than predetermined hydrostatic pressure (the 2nd threshold) with the speed more than [ with the hydrostatic pressure which has passed the 1st valve ] fixed, as shown in figure (**), will change the valve element 3c up, and will close the channel 3b formed in the valve seat body 3a. As a result, with this 2nd valve 3, if it becomes predetermined hydrostatic pressure (hydrostatic pressure beyond the 2nd threshold), a channel will close, and it stops that a fluid flows out of the 2nd valve 3. Various valves which have the same function can be used for the 2nd valve, without limiting to the thing of composition of having explained like the 1st valve here.

[0010]The operation of the zone pressure drive valve constituted as mentioned above is explained. Drawing 4 shows signs that a fluid is poured to the actuator A formed at the tip of a zone pressure drive valve. The input side of the zone pressure drive valve 1 is connected to the fluid pipe 5, and the output side of the zone pressure drive valve 1 is connected to the actuator A. With this zone pressure drive valve, if the hydrostatic pressure in the fluid pipe 5 becomes more than P1 (the 1st threshold), the 1st valve 2 will sometimes open, and it has a function which will be closed if hydrostatic pressure becomes further more than P2 (the 2nd threshold). That is, only when the hydrostatic pressure P is P1<P<P2, it has a function which supplies a fluid to the actuator side as follows.

[0011]That is, in the drawing 4 (**), when the hydrostatic pressure P of a fluid pipe is below P1 (the 1st threshold), the 1st valve 2 is still closed. The fluid which the 1st valve 2 opened as it was shown in figure (**), when hydrostatic pressure was more than P1 and less than P2, and passed the 1st valve 2 passes the 2nd valve 3 always opened, results in the actuator A, and operates the actuator

A. In order that the 2nd valve 3 may close as shortly shown in figure (**) if hydrostatic pressure becomes more than P2 (the 2nd threshold), supply of the fluid to the actuator A stops. Here, if the working pressure (the 1st threshold, the 2nd threshold) of said 1st valve 2 and the 2nd valve 3 is changed according to each zone pressure, only when the hydrostatic pressure in a fluid pipe turns into predetermined pressure, a zone pressure drive valve will open and a fluid will be supplied to an actuator. Thus, in this zone pressure drive valve, it becomes possible to set up a different zone pressure for every zone pressure drive valve by the method of setting out of the working-fluid pressure of the 1st valve 2 and the 2nd valve 3, and it becomes possible to operate the actuator linked to them.

[0012][Fluid pressure control device] It continues and the composition of the fluid pressure control device using the above-mentioned zone pressure drive valve is explained. The fluid pressure control device explained here is provided with the three zone pressure drive valves 11, 12, and 13 as shown in drawing 5, and three zone pressure drive valves differ in working-fluid pressure, respectively. Namely, as for the zone pressure drive valve 11 which operates the actuator A1, the zone pressure drive valve 12 which operates the actuator A2, and the zone pressure drive valve 13 which operates actuator A3, the working pressure of the 1st valve 2 and the 2nd valve 3 is changed as follows.

[0013]For example, with the zone pressure drive valve 11 of the left in a figure, the working pressure of the 1st valve 2 and the 2nd valve 3 is as follows.

With the zone pressure drive valve 12 of P1<P<P2 center, it is P5<P<P6 in the zone pressure drive valve 13 of P3<P<P4 right-hand side. However, P1<P2<P3<P4<P5<P6 [0014]For this reason, in a fluid pipe, when [ both ] the flowing fluid pressure P is P1<P<P2, in order that the 1st valve 2 and the 2nd valve 3 may open, the actuator A1 operates with the zone pressure drive valve 11, but. In the actuator A2 and the zone pressure drive valves 12 and 13 corresponding to actuator A3, since the hydrostatic pressure P has not resulted even in P3 and P5 which open each 1st valve, a zone pressure drive valve is not opened but maintains a non-operative state.

[0015]In a fluid pipe, when [ both ] the flowing fluid pressure P is P3<P<P4, in order that the 1st valve 2 and the 2nd valve 3 may open, the actuator A2 operates with the zone pressure drive valve 12, but. With the zone pressure drive valve 11, the 2nd valve 3 closes, in the zone pressure drive valve 13, in order that the 1st valve 2 may not open, the actuator A1 and actuator A3 do not operate, but only the actuator A2 operates. In a fluid pipe, when the flowing fluid pressure P is P5<P<P6, only actuator A3 operates for the same reason as the above.

[0016]Thus, several zone pressure drive valves from which working pressure differs can be connected to a fluid pipe, and various fluid pressure control devices which can operate only the actuator corresponding to the zone pressure needed, respectively can be provided by controlling the hydrostatic pressure in a fluid pipe.

[0017][Flexible tube drive] It continues and the flexible tube drive which uses the above-mentioned zone pressure drive valve is explained. Here, the example which uses the catheter which a medical field may be sufficient as and is used as a flexible tube is explained. Non-invasion, and the inspection of low invasion and medical science are increasing now which greeted the aged society. There is a catheter as one of low invasion medical devices. A catheter is a thin pipe inserted from the cancellation blood vessel of an upper extremity and the membrum inferius for the medical examination of a blood circulatory system disease, and is a medical device mainly used for contrast-medium pouring etc. for internal pressure measurement of the circulatory system, the collection of a blood sample, and angiography. By low invasion, since it can diagnose, it is used briskly clinical [ of the surgery ].

[0018]However, the inside of a blood vessel is dramatically narrow, and it is dramatically difficult to insert by the catheter which is used now and it not only is distorting, but uses a guide wire since there is much branching. Then, the active catheter which a catheter can curve the truncus freely itself and can choose a course at the turning point of a blood vessel is called for. Therefore, research of the active catheter is done from the former in some research institutions. However,

being used by these researches has a shape memory alloy and main special polymer, and since it is an electric type actuator altogether, when the worst, there is fear of fault current. Inner structure is still more complicated and there is a problem which bars utilization, such as endurance and an increase in a wiring number.

[0019]Then, this flexible tube drive (catheter drive) uses the good physiological saline of biocompatibility for both a drive and a transmission-medium driving signal, and constitutes it as a device with high safety which consists of a simple mechanism using the above-mentioned zone pressure drive valve. Drawing 6 is an entire configuration figure of a flexible tube drive (catheter drive), and drawing 7 is an important section enlarged drawing of the catheter.

[0020]In drawing 6 and drawing 7, 21 is a flexible catheter and the control tube 22 corresponding to the fluid pipe mentioned above inside this catheter 21 is arranged, Two or more zone pressure drive valves 24, 25, and 26 are attached to this control tube 22 in the state of penetrating the catheter 21. The operation members 31, 32, and 33 are being fixed to the position which abbreviates to the periphery of the catheter 21, is and is divided into many divisions (it trichotomizes in this example) in a pitch, The end of the elastic bellows 27, 28, and 29 connected to said zone pressure drive valves 24, 25, and 26 is attached to these operation members 31, 32, and 33, respectively. For this reason, when the bellows 27, 28, and 29 are extended, while said operation members 31, 32, and 33 are pushed and the operation members 31, 32, and 33 fall by this, it has the composition of giving modification to the catheter 21. And said bellows, the operation member, and the catheter are covered with the covering tube 23. A control tube can also be arranged on the outside of a catheter if needed.

[0021]In the above-mentioned catheter drive, into the control tube 22, if predetermined fluid pressure is passed from the fluid pressure generator which is not illustrated, the zone pressure drive valve (for example, valve of the numerals 24) corresponding to the fluid pressure opens, the bellows 27 will develop, the operation member 31 will be pressed, and the operation member 31 will be pushed down. As a result, the catheter 21 of this portion will be crooked. In this way, by controlling the fluid pressure in a control tube suitably, the zone pressure drive valve of the part to need can be opened, bellows can be expanded, and a catheter can be changed.

[0022]As mentioned above, although the embodiment of the invention has been described, the 1st valve and the 2nd valve can use the thing of other composition, if the same function can be done so. It can be aimed at various fluid pipes which do not limit to a catheter as a flexible tube, but have flexibility.The working fluid of a zone pressure drive valve can apply a fluid, a gas, etc. Furthermore, this invention can be carried out in any of other forms, without deviating from the pneuma or main features. Therefore, at all points, the above-mentioned embodiment is only mere illustration, and must not be interpreted restrictively.

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[Translation done.]

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a lineblock diagram of the zone pressure drive valve concerning this invention.
[Drawing 2](**) (**)(**) are a top view of the 1st valve (highpass valve) used into the valve, a sectional view, and an operation figure.
[Drawing 3](**) (**)(**) are a top view of the 2nd valve (low pass valve) used into the valve, and a sectional view.
[Drawing 4](b) (**) (**) is a figure explaining the operating state of a zone pressure drive valve.
[Drawing 5]It is a lineblock diagram of the fluid pressure control device which uses the zone pressure drive valve concerning this invention.
[Drawing 6]It is a lineblock diagram of the catheter drive which uses the zone pressure drive valve concerning this invention.
[Drawing 7]It is an important section enlarged drawing in drawing 6.
[Description of Notations]
1 Zone pressure drive valve
2 The 1st valve (highpass valve)
3 The 2nd valve (low pass valve)

[Translation done.]

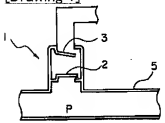
* NOTICES *



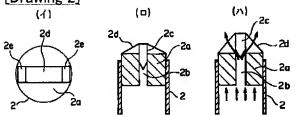
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

## DRAWINGS

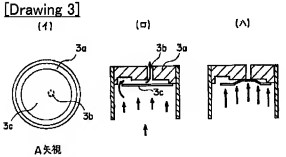
[Drawing 1]



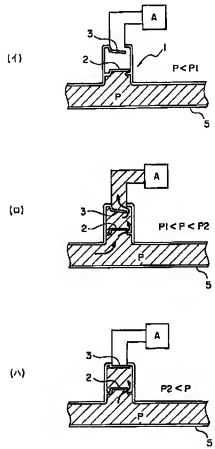

[Drawing 2]



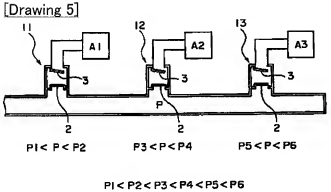

[Drawing 3]




[Drawing 4]

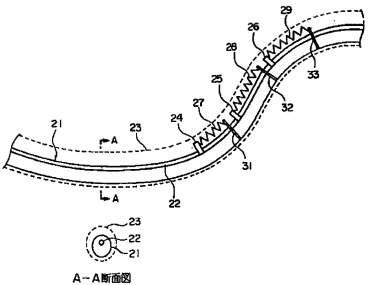



[Drawing 5]



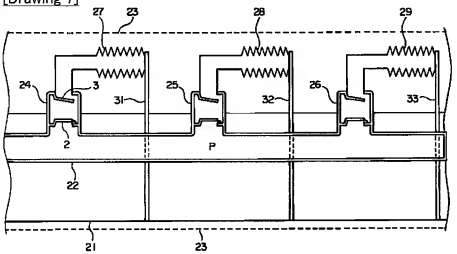

P1< P2< P3< P4< P5< P6

[Drawing 6]




A－A断面図

[Drawing 7]




[Translation done.]